The Water Works of Monterrey, Nuevo Leon, Mexico

Obispado Distributing Reservoir

Compiled by
G. R. G. Conway, Chief Engineer


"PIONEER"
Highest Quality
ASPHALTS
TRADE MARK

"Pioneer" Mineral Rubber Reservoir Waterproofing and "Pioneer" Mineral Rubber Pipe Coating have been used with extraordinary success since 1896

The Waterworks *of* Monterrey, N. L., Mexico

Obispado Distributing
Reservoir

Waterproofed with

"Pioneer" Reservoir Waterproofing Asphalt

Specification for Reservoir Waterproofing

"After the first layer of concrete has become set and is perfectly dry all dust must be carefully brushed off, and on this dry, clean surface, and also in joints between blocks, shall be applied with ordinary paint brushes one heavy coat of '*Pioneer*' *Primer Paint*, manufactured by The American Asphaltum & Rubber Company of Chicago (or any paint equal thereto). Over each joint in concrete there shall be placed a single layer of asphalt-saturated wool felt not less than 8 inches in width, which felt shall be laid in hot '*Pioneer*' *Reservoir Waterproofing Asphalt* (or any asphalt equal thereto), which asphalt shall be heated to a temperature of between 425

and 450 degrees Fahr. On the primed surface and also over the strips of felt shall be mopped a heavy coating of hot asphalt, which coating must be of uniform thickness of ⅛ inch.

"The above specification applies to side walls, bottom and ends of reservoir. After the waterproofing asphalt has cooled the next layer of concrete is to be laid over it as provided herein. No asphalt need be applied in the joints of the second layer of concrete, as this layer is simply to protect the waterproofing asphalt.

"The permanency of the structure depending as it does upon the permanency of the waterproofing materials used makes it necessary to employ only those materials which have been successfully used for this purpose, for say at least a period of not less than five years, and contractors will be permitted to use only waterproofing materials of this class and record."

Obispado Reservoir—General view showing method of filling primary beams—March 1909

The Waterworks of Monterrey, N. L., Mexico

ONE of the most interesting features of the Monterrey (Mexico) waterworks system, which has just been completed, is the reinforced concrete distributing reservoir built for the low-pressure supply service, known as the San Geronimo Gravity Supply. This is situated at the extreme western limit of the city, at the foot of the Obispado hill. It is built of reinforced concrete throughout and its principal dimensions are as follows: Length, 120 linear meters (394 feet 8 inches); width, 80 meters (262½ feet); mean water depth, 4 meters (13 feet 1 inch); capacity, 40,000,000 liters (10,568,000 U. S. gallons). The top water level of the reservoir is 558 meters (1841 feet) above the sea level, an elevation sufficient to give a pressure over the district supplied varying between 27 and 70 pounds per square inch in the mains.

The reservoir has been partly excavated in a clayey formation com-

Obispado Reservoir—Interior view showing beams in position—March 1909

posed of disintegrated "sillar," a local rock of secondary limestone formation, the excavated material being used to form the embankment on the north, south and east sides.

The embankments and excavated portion of the reservoir have been lined with concrete, 14 inches thick at the bottom and 10 inches thick at the top. The walls have a slope of 1 in 2 and are reinforced with ⅝-inch twisted steel lug bars. The columns supporting the roof are 16 inches in cross-section, reinforced with four ⅝-inch bars and hooped every 15 inches with ⅜-inch twisted steel. These rest on a foundation varying from 4 feet square on solid rock to 6 feet square on the softer strata of a portion of the reservoir foundation. The total number of columns is 360, spaced 5 meters (16 feet) apart. The roof consists of main primary beams 16x24 inches reinforced with four ¾-inch bars and 1x¼ inch flat stirrups, and secondary beams 10x20 inches with four ⅝-inch bars and 1x⅛ inch flat stirrups, which support a roof slab 4 inches thick reinforced with No. 8 gauge expanded metal.

The floor of the reservoir, which was laid after a great part of the roof was completed—so as to get protection from the hot sun—is formed of

Obispado Reservoir—During construction—April 1909

two thicknesses of concrete. The lower, 5 inches in thickness, was laid in alternate panels between the columns, and upon this lower thickness a waterproof layer of asphalt was laid. The material used was supplied by The American Asphaltum & Rubber Company of Chicago, Ill., U. S. A., and the work was carried out by ordinary Mexican labor, after receiving a few days' instructions from one of the superintendents of the Asphalt Company. The concrete for the floor was composed of three and a half parts of crushed limestone, two and a half parts of the same rock crushed to form sand, and one part of the local Hidalgo portland cement. The concrete was brought to a comparatively smooth surface and after having been kept moist for ten days by sprinkling was allowed to get thoroughly dry and the surface was carefully swept. Upon this prepared surface one coat of "Pioneer" paint was spread with paint brushes and the asphalt poured upon it to a depth of not less than ⅛ inch after having been heated in boilers and brought to a temperature of about 425 degrees Fahr. Where the floor joined the pedestals of the columns two coats of asphalt were applied. The finishing coat of concrete was then placed in position on the top of the asphalt, laid in panels

Obispado Reservoir—Laying "Pioneer" Waterproofing Asphalt on floor—April 1909

breaking joints with the lower panels, thus giving a total thickness to the floor of 10 inches, the floor surface being carefully finished with a float, the fine stuff being brought up to the surface, but no plastering was allowed.

For the purpose of determining if the reservoir showed any signs of leakage, rubble drains 15 inches wide and 9 inches deep were laid under the floor so as to lead any leakage there might be to a 12-inch drain carried to an inspection pit outside of the reservoir. Altogether there were about 1160 linear meters (3828 feet) of drain.

The construction of the concrete work of the reservoir, which occupied about six months, was begun in the middle of January and completed in the middle of July 1909.

The following are some of the quantities of material used in this reservoir, including the inlet valve house, central tower, outlet house, etc.:

Concrete, 6003 cubic meters (7984 cubic yards). Steel reinforcing bars, 170 tons, or 55.1 miles. Expanded metal for roof, 3½ tons, or 2.57 acres. Number of columns, 360. Number of primary beams, 374. Number of secondary beams, 1184.

Obispado Distributing Reservoir, Monterrey, Nuevo Leon, Mexico, waterproofed with "Pioneer" Wate

Waterproofing—In addition to "Pioneer" Waterproofing Asphalt —covering about 2½ acres of space and a coat of "Pioneer" primer paint—the walls of the reservoir internally were given two coats of "Te-Pe-Co" waterproofing (supplied through The American Asphaltum & Rubber Company of Chicago, Ill.). "Te-Pe-Co" is a liquid mineral solution and was applied with ordinary flat brushes, two coats covering about

erproofing Asphalt, supplied by The American Asphaltum & Rubber Co., Chicago—General view looking south

2236 square meters of surface, the second coat requiring less solution than the first. The first coat was applied by four laborers, at 1 peso each per day, in twelve days, making the cost of the first coat 2.15 cents, Mexican, per square meter. The second coat was applied in four days by thirteen men, at a cost of 2.33 cents, Mexican, per square meter.

The reservoir was partly filled, to a depth of 6 feet, and allowed to

Obispado Reservoir—Painting the first layer of floor—May 1909

remain so for several weeks, and no signs of any leakage were observed. The reservoir was then emptied and refilled on August 30, in forty hours, to its full capacity, when it became necessary to make use of the low-pressure supply, due to the recent flood, which temporarily cut off the supply main of the high-pressure reservoir. Since that date there has been no leakage whatever, proving that the methods adopted to insure water-tightness were successful.

The accompanying photographs show the work in various stages of progress. The reservoir has been laid out with grass plots and gravel paths, and the whole of the area owned by the company, amounting to about thirty acres, is being developed as a public park, which, when finished, will be the most beautiful of its kind in Mexico.

The reservoir was designed by Mr. G. R. G. Conway, M. Am. Soc. C. E., M. I. Mech. E., and built under his direction.

Obispado Reservoir—Showing "Pioneer" Waterproofing Asphalt on floor

"Pioneer" Stands First With Engineers

BECAUSE it has repeatedly demonstrated that it will not dry out nor disintegrate on exposure to air, water, alkalies or acids—because it is absolutely impervious to moisture and weather conditions—leading engineers have been specifying "Pioneer" Reservoir Waterproofing Asphalt for important work during the last fourteen years.

It is meeting the demand everywhere. Big municipal reservoirs in all parts of the country have been made more serviceable—more durable—by the use of this material. The Bedford reservoir at Pittsburg, Pa., was waterproofed with "Pioneer." So were the reservoirs at Mansfield, Findlay and Wyoming, Ohio; St. Louis, Mo.; Independence and Iola, Kan.; Muskogee, Okmulgee and Chickasha, Okla., and a great many other reservoirs in this country. This material has no equal for waterproofing concrete structures, such as bridges, dams, reservoirs, tanks, tunnels, retaining walls, floors, basements, foundations, subways and all kinds

A FEW OF THE MANY RESERVOIRS WATERPROOFED WITH "PIONEER"

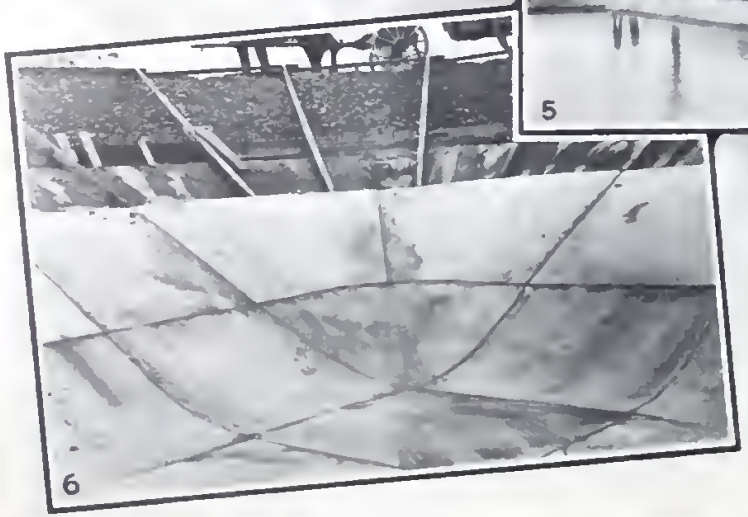
1—St. Louis, Mo., Reservoir, capacity 25,000,000 gallons, 1906 2—Findlay, Ohio, Reservoir, capacity 4,000,000 gallons, 1906
3—Mansfield, Ohio, Reservoir, capacity 3,700,000 gallons, 1905

of concrete construction. It is not an oil asphalt. It is made from the purest of hydrocarbons known (Gilsonite), and which is obtained from our own mines in Utah. It is sufficiently elastic to allow for settlement in a concrete structure without breaking or cracking the waterproof stratum. Neither hot nor cold weather has practically any effect on it. It is always uniform, and the manner of using it is so simple that expert help is unnecessary.

Burns & McDonnell, the well known hydraulic engineers of Kansas City, Mo., have been using "Pioneer" Reservoir Waterproofing Asphalt for years. Their reasons are briefly stated in a letter addressed to us, under date of February 24, 1908, in which they say:

"We have used your waterproofing material for concrete, exclusively, for a number of years, as we have found by long experience and numerous trials that it more nearly complies with the rigid requirements of this difficult subject than any other that we have been able to try. We have found this material elastic enough to yield to the varying widths of expansion joints due to the different temperature stresses, maintaining a water tight joint under all conditions."

A FEW OF THE MANY RESERVOIRS WATERPROOFED WITH "PIONEER"



4—Muskogee, Okla., Reservoir, capacity 3,000,000 gallons, 1905
5—Chickasha, Okla., Reservoir, capacity 2,080,000 gallons, 1906
6—Pittsburg, Pa. (Bedford Reservoir), capacity 2,200,000 gallons, 1907
7—Okmulgee, Okla., Reservoir, capacity 500,000 gallons, 1906

"Pioneer" Mineral Rubber Pipe Coating

Just a few facts regarding this remarkable material

It was first used on the 50-inch steel pipe line of the Minneapolis, Minn., waterworks in 1896. At that time it was known as "Assyrian" Asphalt, and its adoption was recommended by City Engineer F. W. Cappelen only after a long series of the most gruelling tests. In 1903 (when the name "Assyrian" had been changed to "Pioneer" Mineral Rubber Pipe Coating), Mr. Cappelen, then a consulting engineer, asked for a sample of it with a view to making an analysis and determining whether or not it was the same material as that used at Minneapolis. Writing to us in reference to the matter in May, 1903, he says: "Sample was furnished and analyzed and I am pleased to state that the constituents of this material are practically the same as that used by myself about six

years ago, and supplied by the Assyrian Asphalt Company, and referred to in paper read by me at the seventeenth annual convention of the American Waterworks Association, in June 1897."

Probably most of the steel pipe manufactured in this country during the last fourteen years is protected to-day with "Pioneer" Mineral Rubber Pipe Coating because *it is known to be the only safe and reliable pipe coating produced.* Tests have proven it. Long service has proven it. And for these reasons it is specified by leading engineers, among whom we may mention the following:

Morris Knowles.....*Pittsburg, Pa.*
E. E. Brownell.....*Philadelphia, Pa.*
Laurin & Leitch.....*Montreal, Can.*
J. H. Fuertes.....*New York*
S. H. Woodbridge.....*Washington, D. C.*
Clemens Herschell.....*New York*
W. C. Hawley.....*Wilkinsburg, Pa.*
W. C. Goodwin.....*Kansas City, Mo.*
H. J. Hancock Jr.....*Fort William, Ont.*
A. B. Shepherd.....*Pittsburg, Pa.*
C. E. Gillette.....*Philadelphia, Pa.*
Sanderson & Porter.....*New York*
R. O. Wynne-Roberts.....*London, Eng.*
H. L. Shaner.....*Lynchburg, Mass.*
C. H. Rust.....*Toronto, Can.*
Shirley Baker.....*San Francisco, Calif.*
Hering & Fuller.....*New York*
R. H. Thompson.....*Seattle, Wash.*
G. H. Benzenberg.....*Cincinnati, Ohio*
D. D. Clark.....*Portland, Ore.*

Wherever pipe line construction is contemplated the question of the proper protection and preservation of the pipe ought not to be decided

upon mere claims, but the rigid demands of *specifications that are safe* should be enforced as a check upon lax methods and inferior materials.

"Pioneer" Mineral Rubber Pipe Coating will not blister, scale nor crack and, despite extreme atmospheric or soil conditions, it adheres tenaciously always, is not affected by salts or acids, and will withstand electrolytic action.

By writing for data *any interested engineer can satisfy himself in advance* that this is the most economical and efficient pipe coating in the world. As a precautionary measure we would advise engineers to insist that manufacturers who *claim* to produce a coating material equal to "Pioneer" be made to show records in support of their claims.

As a further protection engineers invariably adopt the form of specification appearing on the following page, being broad enough to admit all materials of required merit and record.

"Pioneer" Mineral Rubber Pipe Coating will be used this summer (1910) for the protection of 24 miles of steel pipe line in connection with the waterworks system of the city of Portland, Oregon.

Specification for Coating Steel Pipe

Each section of pipe after all caulking has been completed and tested and all grease, dirt, loose scale and rust removed, shall be heated to about 300° F. by a method which will not injure it, and then dipped vertically in a hot bath of "*Pioneer*" *Mineral Rubber Pipe Coating* (manufactured by The American Asphaltum & Rubber Co. of Chicago) or a coating material equal thereto, the Coating being maintained at a temperature of between 400 and 425° F. The pipe must remain in the bath a sufficient length of time to attain the full temperature of the Coating material and then raised from the bath just sufficiently fast enough to allow the Coating to solidify evenly over the surface of the pipe. It is advisable to avoid any direct currents of air striking the pipe in the course of withdrawing same from the molten bath and in this way prevent an uneven coating. Coating must not be "flashed," must be durable, smooth, glossy, hard, and strongly adhesive to the metal. The pipe must be thoroughly coated and the utmost care exercised after it has been applied, to avoid any injury to the surface while being handled in transportation and in the trench; any injury to the Coating in transportation or hauling must be repaired in the field by the use of the same material, applied hot in the field with ordinary paint brushes, or "*Pioneer*" *Mineral Rubber Field Paint* (to be applied cold and to be made of the same basic materials as the Pipe Coating material) produced by the same Company. It may be necessary from time to time to temper the Pipe Coating material with a "flux" manufactured by the same Company.

The Engineer must be satisfied that the Pipe Coating to be used will be supplied by a Company who can show that they have been manufacturing it for at least the past ten years, and that it has been successfully used during that time and is made by the same processes, formulae, and materials from which the Pipe Coating used upon the Minneapolis, Minn., Pipe Line in 1896 was made.

The Chemical Analysis of the Pipe Coating shall be approximately as follows:

Pipe Coating shall be uniform, homogeneous, free from water, insoluble salts or any other impurities.

Specific Gravity (by suspension in water method) shall not be more than one (1.)

It shall contain at least 99% Bitumen, soluble in cold Carbon Di Sulphide.

It shall contain Petrolene, soluble in Petrolic Ether to the extent of between 60% and 68%.

The melting point shall be not lower than 235° F. (per test recommended by A. M. Soc. C. E.)

It shall contain not more than 12% of fixed Carbon (per test recommended by A. M. Soc. of Testing Materials.)

It shall contain not over one per cent of Free Carbon.

Penetration by Dow Standard will not vary more than five (5) points from the following:

No. 2 N. 5 sec. 100 gms. 77° F.....25
No. 2 N. 1 min. 200 gms. 32° F.....10
No. 2 N. 5 sec. 50 gms. 115° F.....40

Evaporation Test:—20 gms. of the Compound when heated 5 hours in a flat bottom dish 2½ inches in diam. 1 inch high in a regulated oven having a temperature of 205° C. shall not lose over 3½%.

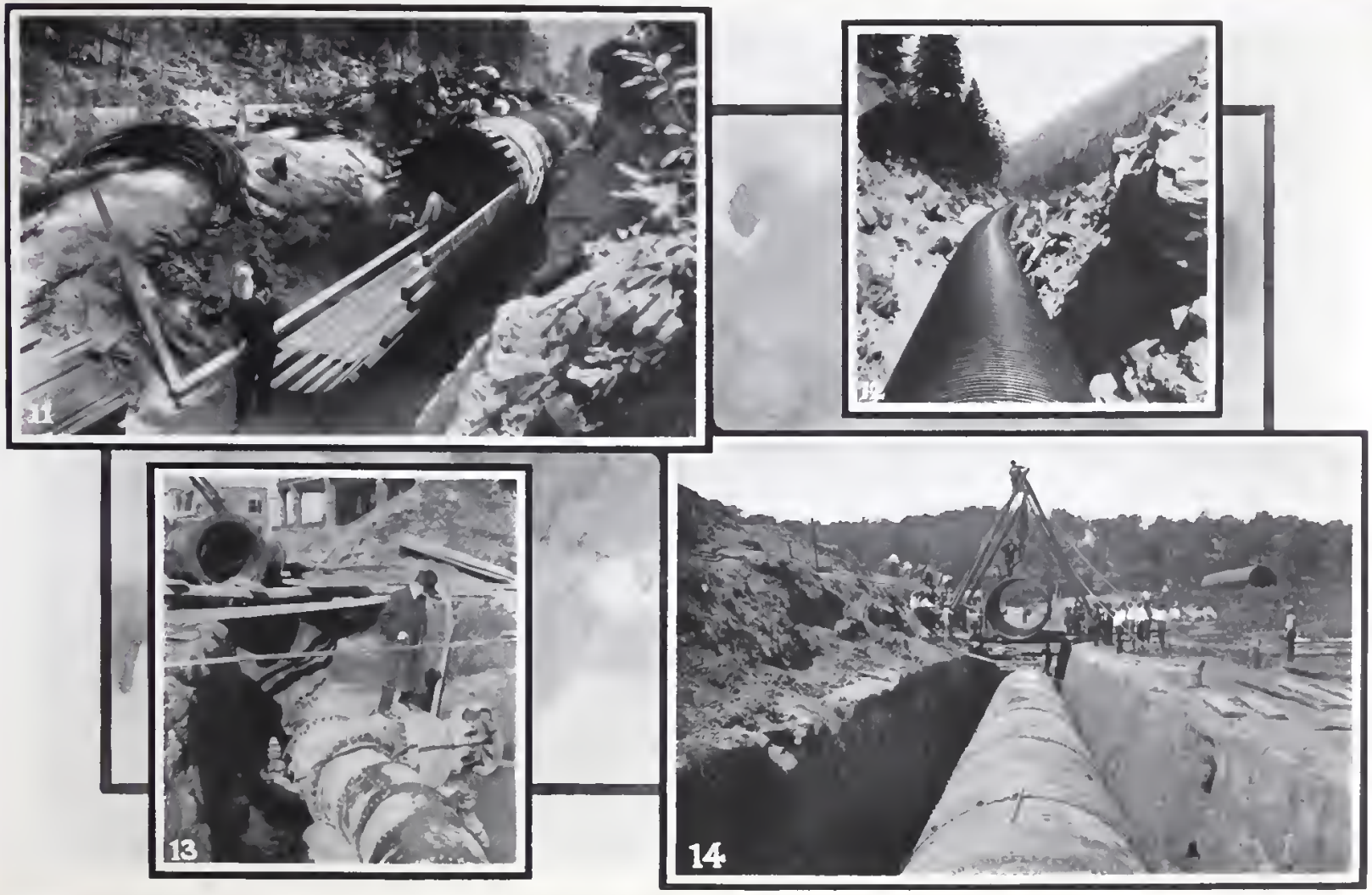
With a view of determining whether the Coating material will withstand the action of the alkali and acid salts found in the earth following test is recommended:—

Immerse a cubic inch of the Pipe Coating for twenty-four (24) hours in a fifty per cent ammonium solution or 35% Hydro-Chloric acid solution. The material must show no effects from the immersion and the solution must not be discolored.

8—50-inch Riveted Steel Pipe, coated with "Pioneer" Mineral Rubber Pipe Coating. Minneapolis, Minn., 1896.

9—52-inch Steel Pipe, coated with "Pioneer" Mineral Rubber Pipe Coating. Seattle, Wash.
10—84-inch Wooden Stave Pipe, steel bands coated with "Pioneer" Mineral Rubber Pipe Coating. Duluth, Minn.

11—102-Inch Wooden Stave Pipe, coated with "Pioneer" Mineral Rubber Pipe Coating. Tumwater Canon, near Leavenworth, Wash.
12—Wooden Stave Pipe Line, coated with "Pioneer" Mineral Rubber Pipe Coating. Leavenworth, Wash.



13—36-inch Steel Pipe, coated with "Pioneer" Mineral Rubber Pipe Coating. Montreal, Canada.
14—96-inch Steel Pipe, coated with "Pioneer" Mineral Rubber Pipe Coating. Pittsburg, Pa.

Our Products

"Pioneer" Filler Asphalt for Brick Floors and Pavements
"Pioneer" Mineral Rubber Pipe Coating
R. R. Bridge Floor Waterproofing
Paints

"Pioneer" Road Asphalt	Roofing Pitch or Asphalt
Anti-Acid Compounds	Waterproofing Asphalt
Asphalt Floor Mastic	High Grade Asphalts
Mineral Rubber	Insulation Paint
Ready Roofing	Paving Cement

The American Asphaltum & Rubber Co.

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